

DESCRIPTION OF THE NYMPH OF *OPHIOGOMPHUS HOWEI*
(ODONATA: GOMPHIDAE)

JAMES H. KENNEDY AND HAROLD B. WHITE III

(JHK) Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061; and (HBW) Department of Chemistry, University of Delaware, Newark, Delaware 19711.

Abstract.—The nymph of the little known dragonfly *Ophiogomphus howei* Bromley is described for the first time. It is distinguished from other members of the genus by its small size (19.0–22.5 mm in length), the absence of dorsal hooks and the vestigial nature or absence of lateral spines on abdominal segment 7. The geographical range of *O. howei* is extended from the Susquehanna River in Pennsylvania to the New River in Virginia and North Carolina where it is a significant component of the benthic fauna. The nymphal habitat, species associations, food preference and emergence patterns are reported along with some observations of adult behavior.

The holotype description of *Ophiogomphus howei* Bromley (1924) was made based on one female adult. Likewise, Calvert (1924) described the male of *O. howei* based on one specimen. Until its recent discovery in a section of the New River in Virginia only one other *O. howei* specimen had been recorded since the original descriptions. This was a teneral female taken in 1967 from the Susquehanna River near Halstead, Pennsylvania (Thomas W. Donnelly, personal communication). Despite the fact that *O. howei* has been one of the most sought after species in North America it has eluded collectors and its nymph has remained undescribed for over 50 years (M. J. Westfall, personal communication).

As part of a study to determine species composition of the benthic invertebrate fauna in the New River, a mature *Ophiogomphus* nymph was collected in December 1976, a few meters upstream of St. Rt. 721 bridge, Carroll County, Virginia. The nymph was reared in facilities at Virginia Polytechnic Institute and State University; and in February 1977, a female *O. howei* emerged. Additional nymphs were reared and the exuviae were conspecific with exuviae collected from the Susquehanna River near Halstead, Pennsylvania. The morphological terminology given by Corbet (1953) and Snodgrass (1954) is used in the following description of the *O. howei* nymph.

Mature Nymph.—Body length 19.0–22.5 mm (20.5 aver.), abdominal width 5.6–6.1 mm (5.6 aver.), head width 4.5–4.9 mm (4.7 aver.).

In general the mature nymph is a greenish brown. Earlier instars have more of a yellowish-brown body. Preserved nymphs are a light brown. Body is covered with coarse cuticular granules.

There are 4 antennal segments. The length to width ratio of antennal segment 3 is less than 2.0 (1.86–1.95). The labium is as shown in Fig. 2A. The distal margin of the median lobe is evenly arcuate with 32–36 blunt teeth and 61–68 piliform setae. The distal margin of each palpus possesses 11–13 rectangular dentations. Setae are present on lateral margins of the thorax. Wing pads, 4.5–5.0 mm long, extend to the base of abdominal segment 4. The legs have prominent setae present on femora, tibia and tarsal segments.

Abdominal tergal segments 2–9 in profile are somewhat arched longitudinally with a blunt rounded apical projection but no dorsal prominences (Fig. 2B). The abdominal terga in addition to well-marked submedian and lateral rows of spots have a dark pigmented blotch on segment 6. This characteristic may fade in preserved specimens. Subequal lateral spines are present on segment 8–9. A lateral spine may weakly be present on abdominal segment 7. Cerci are slightly less than $\frac{2}{3}$ of the epiproct length. Cerci basal width is approximately $\frac{5}{8}$ their length.

The nymph of *O. howei* is easily distinguished from all other *Ophiogomphus* nymphs by its small size and lack of any dorsal hooks or prominences. The absence of a lateral spine on segment 7 is also diagnostic for this species. However, this trait is variable and in approximately 40% of the examined specimens a weak spine was present.

Material examined.—6 nymphs and 26 last instar exuviae from Virginia Carroll Co., New River, near Galax. 10 last instar exuviae from North Carolina: Alleghany Co., New River. 4 exuviae from Pennsylvania: Susquehanna Co., Susquehanna River. Last instar exuviae and adult specimens have been deposited in U.S. National Museum, Washington, D.C.; Florida State Collection Insects and Arthropods, Gainesville, Florida; Department of Entomology, University of Michigan, Ann Arbor, Michigan; Department of Entomology, Purdue University, West Lafayette, Indiana; and Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.

Range.—Nymphs and adults of *O. howei* were collected from a 39.1 km section of the New River which flows through North Carolina (Alleghany Co.) and Virginia (Grayson, Carroll Co.). Elevation ranges from 732 m (2400 ft) to 640 m (2100 ft) above sea level in this area. The New River near Galax, Virginia (36°39.5'N, 80°59'W) is a site nearly central to the distribution of *O. howei*. Exuviae were also collected from the Susquehanna River in Pennsylvania (Susquehanna Co., 41°57.5'N, 75°40'W). The original descriptions

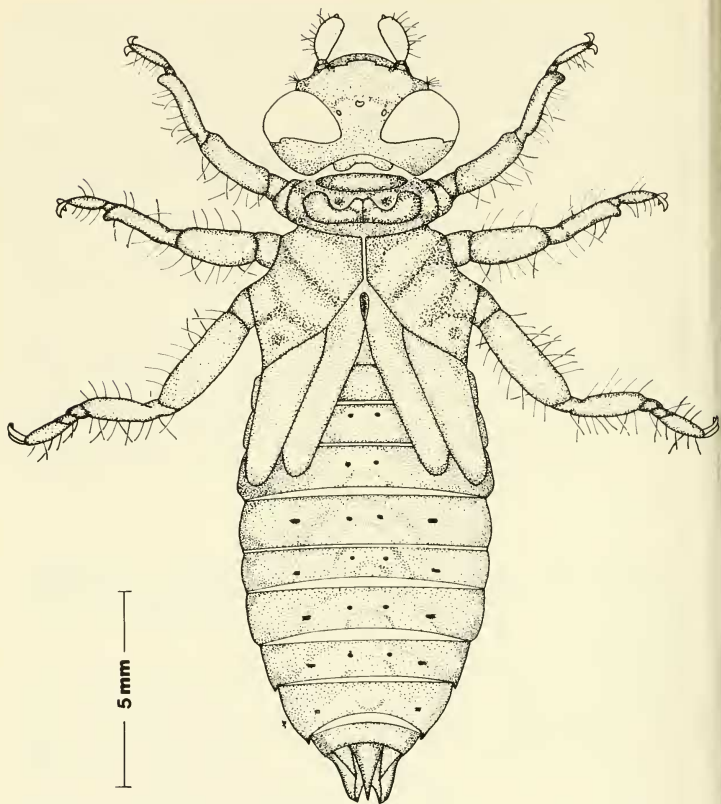


Fig. 1. *Ophiogomphus howei*, dorsal view.

of the adults were from specimens taken in Amherst, Massachusetts and Lemoyne, Pennsylvania near the Connecticut and Susquehanna Rivers, respectively.

Ecology.—Nymphs were found in sand and gravel in swiftly flowing water. The average annual flow of the New River near Galax, Virginia is 51 m³/sec. The New River is approximately 200 m wide and 0.30 m deep in this section. The flow, depth, width and substrate characteristics of the

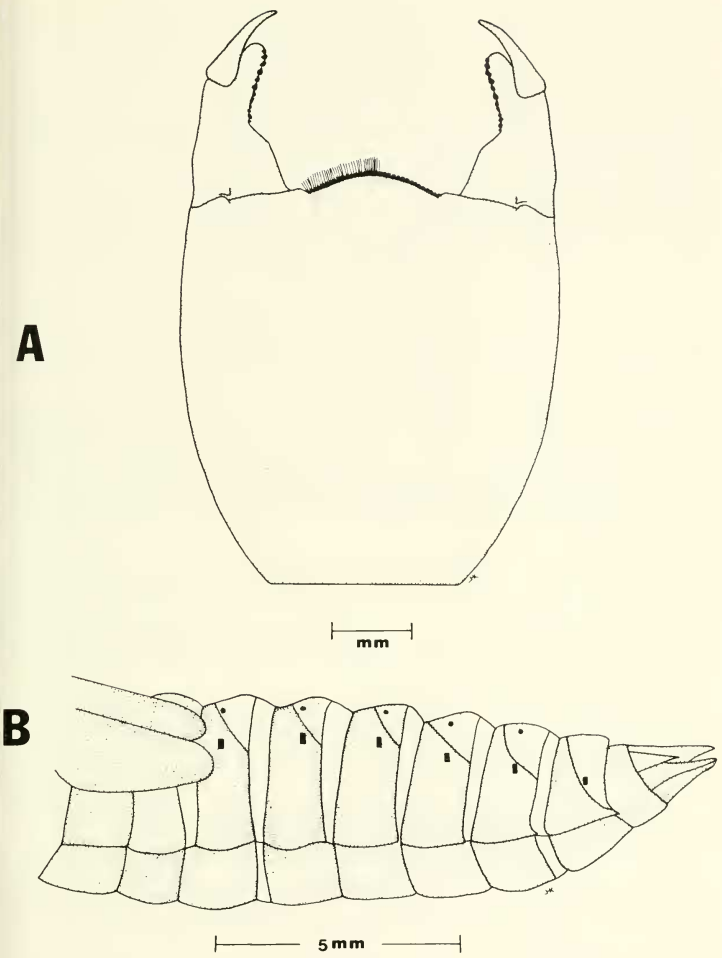


Fig. 2. *Ophiogomphus howei*. A, Labium (note $\frac{1}{2}$ piliform setae are deleted to show tooth structure of median lobe). B, Abdomen, lateral view.

Susquehanna River near Halstead, Pennsylvania are similar to the New River.

Physical and chemical properties of the New River within the distribution range of *O. howei* were monitored monthly from 1970 to 1975 at three locations. Ranges of selected physical and chemical parameters are as follows: Calcium, 2.00–6.50 ppm; magnesium, 0.80–2.10 ppm; sulfate 0.00–7.40 ppm; chloride, 0.30–5.40 ppm; pH, 6.10–8.45; hardness, 9.90–22.40; Biological Oxygen Demand (BOD) 0.01–6.15 ppm; and nitrate 0.304–3.49 ppm. Dissolved oxygen (D.O.) was always near the saturation point. Water quality in this area of the New River is excellent because the drainage basin has few major industrial sites (Benfield and Cairns, 1974). Comparable water chemistry data from the Susquehanna River are not available. However, two spot surveys done by the Pennsylvania Fish Commission indicate the Susquehanna has a greater hardness (46–82 ppm) (Clark Shiffer, personal communication). Further reliable comparisons between the New and Susquehanna Rivers are not possible.

Odonata nymphs sympatric with *O. howei* in both the Susquehanna and New rivers included *Gomphus* (*Gomphurus*) *vastus* Walsh, *G. (Tylurus) spiniceps* Walsh, *Macromia illinoensis* Walsh and *Neurocordulia yamaskanensis* Provancher. *Ophiogomphus rupinsulensis* (Walsh) was associated with *O. howei* in the Susquehanna and *Ophiogomphus aspersus* Morse in the New River.

Emergence on the New River in 1977 began 30 April and continued through the first part of May. Peak emergence occurred 4–5 May. The last exuviae were picked up 15 May 1977. *Ophiogomphus howei* emergence in 1978 began 21 May 1978. Water temperature at the time of emergence in 1977 and 1978 was approximately 19°C.

The nymphs were observed climbing out of the river and up vertical mud banks. Emergence either occurred while clinging to the exposed mud bank or in the grassy vegetation on the top of the bank. Emergence occurred between early morning and early afternoon. Teneral *O. howei* kept alive up to seven days have yellow markings. They are devoid of the green thoracic coloration typical of other eastern species of *Ophiogomphus*.

Foregut contents of 5 *O. howei* mid-instar nymphs collected during the summer of 1977 revealed water mites (Arachnida: Acari: Prostigmata) mayfly nymphs (Ephemeroptera: Baetidae) and midge larvae (Diptera: *Chironomidae*: Tanytarsini). Two distinct size classes of *O. howei* were collected from the New River suggesting a 2 year life cycle.

Adults are strong fliers and were observed migrating into trees after emergence. Active *O. howei* adults were observed 7–10 m high in trees in the late afternoons until dusk. Ovipositing was not observed in the New River. However, adults were observed to leave their perches high in trees and fly

very fast over the surface of the Susquehanna River late in the afternoon (Thomas W. Donnelly, personal communication).

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